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## CropWatch No. 98-6, April 24, 1998

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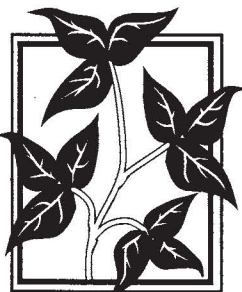
# CROP WATCH

University of Nebraska Cooperative Extension  
Institute of Agriculture and Natural Resources

No. 98-6  
April 24, 1998

## Technological improvements lead to long-term soybean yield increases

Soybean production in Nebraska has increased substantially in the last 60 years. In 1938, just 1,000 acres were harvested, but 60 years later, in 1997, 3.45 million acres were harvested, an increase of 3,450%. The average yield in 1938 was 12 bu/ac, but in 1994, it was a record 47 bu/ac, an increase of 391%. Nebraska produced just 12,000 bushels in 1938, but produced a record 136 million bushels in 1992, an increase of 11,330%.



Nebraska soybean yields are increasing at a rate of about 0.44 bu/ac per year. This annual yield improvement, which is the largest among the soybean growing states, is a tribute to Nebraska soybean producers who rapidly adopt cost-effective technologies to improve their soybean production efficien-

cies.

Do you consider 0.4 bu/ac to be a trivial amount? Take a hard look. Suppose you grow 500 acres of soybeans each year. If you ignore one year's technological advances in soybean production, you will fall behind innovative producers by more than 200 bushels this year alone ( $500\text{ac} \times 0.44\text{ bu/ac} = 220\text{bu}$ ). Next year, you will be 400bu behind, then 600bu behind the year after that. Multiply these amounts by the current price per bushel for the potential economic impact.

Two major types of technological innovations are available to farmers — genetic and agronomic. *Genetic technology* is defined as the continual release of soybean varieties that have higher yields, better disease and pest resistance, and greater tolerance to drought and heat stress. *Agronomic technology* can

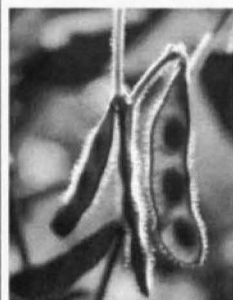


be defined as the continual development of methods that enhance the yield potential of the production environment (e.g., new management practices, equipment improvements, better pest control methods, etc.).

*Genetic improvement* represents a relatively inexpensive, yet very effective technological input into a production system. Experiments conducted at the University of Nebraska showed that approximately one-half of the annual 0.44 bu/ac increase in state soybean yields (i.e., 0.22 bu/ac/yr) is due to genetic improvement. Smart soybean producers recognize that the new variety releases of this year will, on average, be about 2.2 bu/ac better than the variety releases of ten years ago. Is anybody out there growing a 10-year or 20-year old variety?

The best approach to keeping up with the new variety releases is

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### Special focus: Soybeans

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## Field updates

**Chuck Burr, Extension Educator in Clay and Webster counties:** Acres planted to soybeans in 1998 should reach a new high likely be a significant increase from 1997 acres, which were up about 20% from previous levels. Farm program changes, pest management and fertility advantages from the crop rotation are reasons for the increased acres.

**Steve Pritchard, Extension Educator in Platte County:** Moisture has delayed most field work. Moisture levels varied across the county, with the northern portion

receiving about 2-2.5 inches last week. A few producers are starting to get into the fields around the Columbus area and areas with sandy soils. We are seeing some disking and anhydrous application early in the week in those areas.

**Ralph Anderson, Extension Educator in Buffalo County:** We had about an inch of moisture April 14 that stopped most field operations. Fertilizer applications and stalk shredding started again April 19 and were expected to be in full gear this week. Planters are poised and ready as soon as the fields dry. Some corn has been planted in

sandy fields south of the Platte and some will be planted this week but most planters will not hit the fields before April 27.

We continue to see army cutworms in alfalfa — many acres have been treated. All sizes of worms are present and in many cases, total numbers are large.

Spring moisture has been most welcome on dryland alfalfa and pastures recovering from the dry early summer last year. Wheat fields are greening and appear in good condition.

## Soybean technology

(Continued from page 51)

to examine the results of soybean yield trials in your area, including University trials. Compare the yields of the new varieties against the older ones. If the University yield trials show that newly released varieties are outperforming the varieties that you currently grow on your own farm, you need to take action. Use the University test data to select the best new varieties and evaluate these in strip tests conducted on your own farm using your management conditions. If the new variety proves to be better than a variety you now use, don't hesitate, use it.

If you are a smart soybean producer, you need to continually seek out, and personally evaluate, any newly developed soybean production technology. Adopt the most cost-effective ones. Make sure that your farm reaps the annual 0.44 bu/ac yield increase that results from technological innovation.

**James E. Specht**  
Professor of Agronomy



# CROP WATCH

1998 University of Nebraska

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# Fertilizing soybeans

*Stories by Charles Shapiro, Extension Soil Scientist, Northeast REC, Halley Agricultural Laboratory, Concord  
Gary Hergert, Extension Soils Specialist, West Central REC, North Platte*

## Nitrogen

Two aspects of soybean fertilization — the importance of late season nitrogen application for enhancing soybean yields and the possibility of using foliar fertilizer mixes later in the growing season — have been hot discussion topics among soybean producers.

The resurgence of interest in these fertilization methods is similar to the interests that developed 20 years ago after Dr. John Hanway produced some significant yield increases with an NPK foliar mix on soybeans. Many other scientists were never able to duplicate the results. About the same time two UNL professors, Drs. Robert Sorenson and Ed Penas conducted considerable research applying nitrogen to soybeans. There is limited information to show that nitrogen response of soybeans will be consistently profitable. The most likely time when there will be nitrogen response is:

Effect of nitrogen rate and timing on soybeans, West Central REC, 1997.

| <i>Treatments</i> | <i>Yield<br/>bu/A</i> |
|-------------------|-----------------------|
| Check             | 43.75 a*              |
| 50# Preplant      | 44.75 a               |
| 50# R5            | 45.00 a               |
| 100# Preplant     | 46.75 a               |
| 100# R5           | 47.00 a               |

- 1) when residual soil nitrate is extremely low,
- 2) the soil has a low mineralization capability, or
- 3) if the soil pH is low and the plants do not nodulate properly.

The earlier Nebraska research showed that soybeans responded to nitrogen about 50% of the time, however it wasn't possible to predict the response based on soil characteristics. Rates of 50-100 lb nitrogen were required to increase yields by about one bushel.

Research this year at North Platte compared the application of nitrogen as ammonium nitrate preplant or later at the R5 or beginning pod stage. The results did not show any significant yield increase. This soil had an initial soil nitrate of 65 pounds in the upper 3 feet.

Data from other states also shows that applying nitrogen to soybeans may or may not increase yield. In Minnesota when yield data was combined over many years, 82 varieties were compared at various nitrogen rates and timings. Thirty-five sites had increases, six sites had decreases and 41 stayed the same. The average yield increase over the 82 sites was 2.3 bushels per acre. Kansas data in 1995 and 1996 showed that at least 40 lb of nitrogen applied at the R3 stage increased yield 60% of the time. Our recommendation would be to approach these changes slowly by conducting replicated test strips to prove the practice on your farm with your varieties.

## Phosphorus and Potassium

Soybeans are more efficient than corn at producing yields at lower phosphorus levels. Yield increases from applied phosphorus will probably occur only when soil tests are below 12 ppm Bray 1 phosphorus. For many Nebraska soils, sub-soil levels of phosphorus are usually not considered in phosphorus response; however, Nebraska sub-soil phosphorus levels may be somewhat higher than those found throughout much of the Midwest. This may explain the lack of phosphorus response for some soils.

Generally there is no great advantage to using a starter fertilizer rather than a broadcast fertilizer for phosphorus because the "starter

effect" usually is not as noticeable on soybeans as it is on corn. Since the growing point of soybeans is above the soil surface whereas corn's is below, soil temperature effects on early growth usually are not as great. Soybeans also are planted later than corn when soil temperatures are high. Banding phosphorus may be more beneficial than broadcasting on soils that test very low in phosphorus. These fertilizer bands should be 10 to 15 inches apart and 3 to 6 inches deep. If phosphorus is applied at planting, the fertilizer band should be at least 1 inch from the seed. **No fertilizer should be placed with the soybean**

**seed** because of the risk of seedling injury during germination.

Most Nebraska soils are well supplied with potassium so it usually is not required except on some sandy soils that have very low potassium levels. Follow potassium guidelines given in the NebGuide, *Fertilizer Suggestions for Soybeans*, (G87-859). Zinc deficiency is rare in soybeans but can occur. Soil testing is the best method to determine if zinc is required. For soils where corn and soybeans are grown in rotation, 5 pounds of actual sulfur from zinc sulfate to 10 pounds on calcareous soils usually will correct the problem for three to four years.

# Fertilizing soybeans

(Continued from page 53)

Stories by Charles Shapiro, Extension Soil Scientist, Northeast REC, Halley Agricultural Laboratory  
Gary Hergert, Extension Soils Specialist, West Central REC

## Liming

A lime requirement test is routinely performed on soils that have a pH less than 6.2. Lime recommendations are based on the buffer pH to provide correction of incorporated lime in the top 6 to 8 inches. This will most likely have the greatest effect when soil pH is less than 5.5 and sub-soil pH is less than 6. Many sub-soils in central Nebraska and some in eastern Nebraska are not acidic; lime application on these soils may show less response. Due to a long history of corn production, some soils are showing depressed pH and high soluble aluminum and manganese.

Liming acid soils increases the ability of the plant to take up other nutrients in the soil. It also enhances microbial breakdown of crop residues which helps release nutrients to plants. Part of the increase in the nitrogen availability from a more optimum soil pH is due to the activity of the nitrogen fixing bacteria in the nodules. They are

Soil characteristics of liming sites at the West Central REC

| Soil type    | Depth in | pH   | Mn (DTPA) ppm | AL ppm |
|--------------|----------|------|---------------|--------|
| Hord sil     | 0-6      | 5.53 | 22.10         | 11.60  |
|              | 6-12     | 5.44 | 17.82         | 9.64   |
|              | 12-18    | 6.53 | 7.60          | 2.22   |
|              | 18-24    | 6.94 | 8.30          | 2.64   |
| Holdrege sil | 0-6      | 5.22 | 29.40         | 8.78   |
|              | 6-12     | 5.21 | 21.50         | 8.28   |
|              | 12-18    | 6.09 | 11.40         | 3.91   |
|              | 18-24    | 6.60 | 8.50          | 4.40   |
| Hord fsl     | 0-6      | 4.93 | 15.70         | 21.40  |
|              | 6-12     | 4.60 | 16.70         | 87.30  |
|              | 12-18    | 5.30 | 13.20         | 10.80  |
|              | 18-24    | 6.15 | 5.30          | 6.70   |
| Valentine fs | 0-6      | 4.90 | 9.44          | 22.94  |
|              | 6-12     | 5.16 | 5.92          | 19.30  |
|              | 12-18    | 5.81 | 2.86          | 4.74   |
|              | 18-24    | 6.17 | 1.74          | 1.66   |

more efficient between pH 6 and 7, although they continue to function well at pH's above 5.4.

Increasing soil pH with agricultural lime should be considered a 7- to 10-year investment. Yield increases in one year will not cover

the lime cost. Usual increases for soybean yields are 3 to 5 bu/a. Data from an Iowa corn-soybean rotation showed profit from lime over six years of \$72 per acre.

**Gary Hergert**  
Extension Soils Specialist

## Inoculation a must on "new" soybean soils

Always inoculate the soybean seed, especially on ground where soybeans have not been grown. Research by Roger Elmore at the South Central Research and Extension Center near Clay Center found that soil-applied inoculant resulted in higher soybean yields than the seed-applied inoculant on new soybean ground. Because of the low cost of the seed applied inoculant, the difficulty of using the soil-applied inoculant, and how important the inoculant is on new soybean ground, growers may want to consider using both products.

Also, using an inoculant on old soybean ground can be cheap insurance.

Soil- versus seed-applied inoculants for soybeans.\*

| Inoculant treatment | Soybean yield (bu/A)              |                |                                   |                |                |
|---------------------|-----------------------------------|----------------|-----------------------------------|----------------|----------------|
|                     | "New" soybean ground <sup>1</sup> |                | "Old" soybean ground <sup>2</sup> |                |                |
|                     | A <sup>3</sup>                    | B <sup>4</sup> | Locations C <sup>4</sup>          | D <sup>5</sup> | E <sup>3</sup> |
| None                | 31.2 c                            | 15.4 c         | 58.4 a                            | 51 a           | 39 a           |
| Seed-applied        | 38.7 b                            | 40.5 b         | 56.8 a                            | 50 a           | 39 a           |
| Soil-applied        | 46.1 a                            | 64.7 a         | 59.2 a                            | 52 a           | 39 a           |

<sup>1</sup>New soybean ground has never had soybeans grown on it.

<sup>2</sup>Old soybean ground has had soybeans grown on it.

<sup>3</sup>Two years data.

<sup>4</sup>One year data.

<sup>5</sup>One year data, two locations.

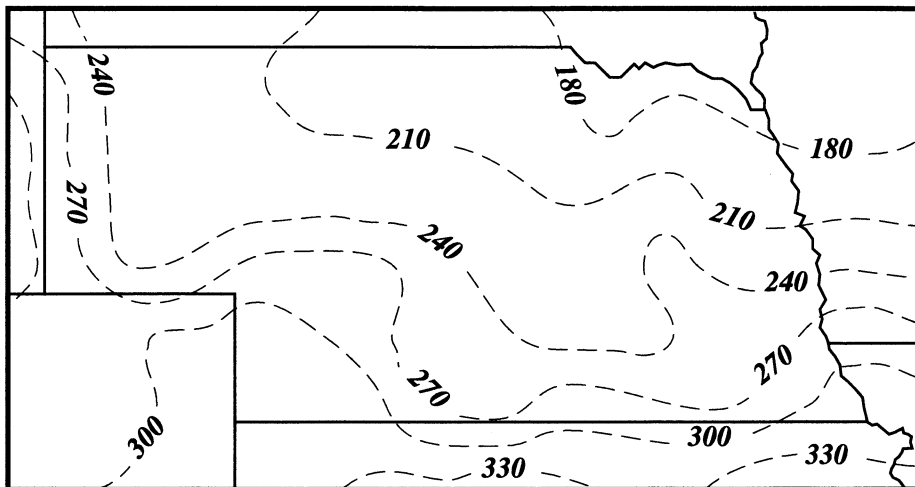
\*Compiled from several research reports from several locations. Yields in columns with different letters are significantly different.



# Begin scouting for weevils in alfalfa

Alfalfa weevils have been the most serious pest of alfalfa in Nebraska over the years. The last few years, damage has been more intensive in the southern half of Nebraska and in the Panhandle. While we have been spared weevil damage in northern Nebraska over the past few seasons, the potential for damage always exists. The mild winter may have enhanced survival of adults so perhaps a greater potential exists for damage state-wide in 1998. While things will be getting very busy in the next few weeks as row crops are planted, those of you who are growing high quality alfalfa hay should take the time to monitor fields for weevils over the next month or so.

A majority of alfalfa weevils overwinter as adults in sheltered areas. They emerge when the weather warms and lay eggs in alfalfa stems. A few eggs will be laid in the fall, and some larvae will overwinter and cause very early feeding damage. Some overwintering larvae have been reported feeding in the Panhandle. Alfalfa weevils feed on first cutting alfalfa



Base 48 growing degree days accumulated Jan. 1-April 20. Spring hatching weevil larvae usually cause noticeable damage at about 300-375 growing degree days.

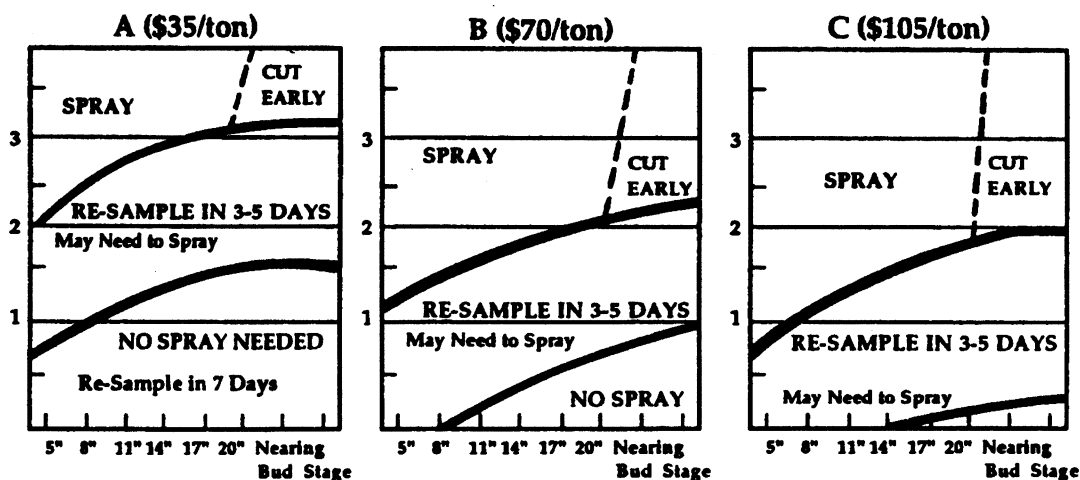
as larvae, and regrowth after the first cutting as adults. (Sometimes late maturing larvae will feed on regrowth. See sidebar.) Spring hatching weevil larvae usually begin doing noticeable damage in Nebraska at about 300-375 growing degree days (48 degree base). We should have reached that level in southern Nebraska by now. Kansas has reported some weevil activity. Check the accompanying GDD chart

for information on GDD accumulations.

It is essential that fields be monitored for alfalfa weevil feeding. Damage consists of small holes eaten on the newest leaflets near the growing tips. Severely damaged fields have a white or gray appearance because of the drying of skeletonized upper leaves and buds.

(Continued on page 56)

## Alfalfa weevil stem count method



Height of alfalfa

Estimating alfalfa weevil economic treatment thresholds by the stem count method.

## Alfalfa weevil *(Continued from page 55)*

The larvae are a small (1/16 to 3/8 inch in length), pale yellowish green, becoming a darker green when larger. These legless worms have black heads and a white stripe the length of the back. The alfalfa weevil larvae spend nearly all their time on the plant. They curl into a C-shape when disturbed.

Once the alfalfa is about 4-6 inches or so in height, take a bucket, carefully cut some stems at ground level (30 to 50 per field, from various spots in the field) and shake the stems against the side of the bucket. Average the number of weevil larvae per stem. Use the charts on page 55 to help determine whether control measures are necessary. Each chart has been developed for a different alfalfa value. To treat or re-sample depends on the average number of weevils per stem, the stem length, and the value of the alfalfa.

It is important to maintain a regular scouting schedule as severe foliage loss can occur in only three to four days at larval population of one to two per stem (alfalfa 8 to 14

inches tall). For more management information, see NebGuide G94-1208-A, *Managing the Alfalfa Weevil*, available at your local county extension office. Insecticide tables are available of the Department of Entomology's WEB site at <http://ianrwww.unl.edu/ianr/entomol/instables>. Registered insecticides commonly available for alfalfa weevil larvae control include Ambush, Baythroid, Furadan, Imidan, Lorsban, PennCap-M, Pounce, Sevin XLR, and Warrior.

**Keith Jarvi**  
Extension Assistant  
Integrated Pest Management  
Northeast REC, Norfolk

## Panhandle perspective

Overwintering alfalfa weevil larvae have been seen in a few areas of the Panhandle in relatively low numbers. Over wintering larvae in Nebraska are not common and are more typical of the southern plains area.

Of greater concern is the upcoming activity of the adults and their offspring this spring. We have not begun to see activity in the Panhandle, but it likely will begin as we move into May. Observations over the last few years have indicated that the weevils in the Panhandle do not seem to develop as rapidly as you would predict using Growing Degree Days (GDD). We have seen weevil feeding damage peaking in June and even continuing into July. Substantial larval feeding is often seen continuing after first cutting and results in significant stubble feeding as the second cutting is regrowing. The impact of the very mild weather on weevil activity and populations is unknown; therefore, growers should be checking their alfalfa fields regularly through May and into June for the buildup of weevil larvae. In the Panhandle damage may still occur after GDD accumulations indicate the threat is past.

## Clover leaf weevils

Clover leaf weevils have been found in heavy numbers in a Panhandle alfalfa field. These insects can be found throughout the state, but they have not been common over the last few years. Clover leaf weevil larvae overwinter as larvae and feed early in the spring. They look much like alfalfa weevils except that they have a light brown head versus a black head for the alfalfa weevil. These insects are not nearly as damaging as alfalfa weevils because of their habit of feeding lower on the plant (generally not on the terminals). In scouting alfalfa fields for weevils, make sure you make a proper identification to avoid confusing these insects.

**Gary Hein, Extension  
Entomologist, Panhandle REC  
Scottsbluff**

# Managing soybean chlorosis

Chlorosis (yellowing) in soybeans is a problem on many Nebraska soils where pH is above 7.4. These problems occur primarily in the Platte, Elkhorn, Republican, and Loup River valleys and on high lime soils in central and western Nebraska. Not all high pH soils cause chlorosis of soybeans.

Soybean chlorosis problems may be indicated by surface soil pH; however, much of the problem is caused by sub-soil pH's, especially at the 12- to 24-inch depth. Sub-soils in chlorotic areas usually have poor internal drainage and higher pH and contain soluble salts, excess lime (carbonates), and may have higher sodium saturation of the cation exchange complex.

A program has been developed to help producers manage soybean chlorosis through: variety selection, seeding density, fertilizer materials with the seed, and foliar treatment. A summary of these practices is given in NebGuide G89-953, *Soybean Chlorosis Management*.

Different varieties have different levels of tolerance to chlorosis. The first step in producing a good yield is to check with your seed company concerning a variety's tolerance to chlorosis. Most companies include this information in their seed books.

Seedling density also influences how well soybeans tolerate an alkaline soil. Research has shown that even with tolerant varieties, seed

*(Continued on page 57)*

# Successful weed control in soybeans?

## Scout; select best herbicide for the job; start early

Controlling weeds in soybeans poses a special type of difficulty, perhaps partly because it means controlling a broadleaf weed in a broadleaf crop and partly because soybeans present little early season competition to weeds.

Typically, the most difficult weeds to control in soybeans are large seeded broadleaves including velvetleaf, cocklebur, morning glory and sunflower. These weeds offer a special challenge because they can germinate early, grow rapidly, produce a large number of seeds and are difficult to control without injury to the crop. Of course there are always other broadleaf weeds such as pigweed and waterhemp and annual grasses including foxtail, sandbur, crabgrass, shattercane, and velvetleaf.

### Preemergence

Attacking weeds before they invade has always been a sound control strategy. Preemergent herbicides can be costly, and it is difficult in some areas to predict the exact infestation to battle, yet for flexibility and piece of mind preemergence herbicides are widely used. Preemergence herbicides, followed by a timely cultivation, may provide effective and economical control of weeds in soybeans.

Authority Broadleaf, Canopy, First Rate, Python and Broadstrike do well on broadleaf weeds and exhibit some action on certain annual grasses. These broadleaf herbicides are complemented when tank mixed with a grass herbicide such as Axiom, Dual, Lasso, Frontier, Prowl or Treflan. Check labels for tank mix guidelines. Herbicides such as Axiom, Command, Dual II, Frontier, Lasso and Prowl, are proven performers on annual grasses, and are often when tank mixed with a broadleaf herbicide. Pursuit Plus and Steel cover a broad range of broadleaf weeds and annual grasses.

### Postemergence

A counter attack strategy once weeds have emerged will be attractive to many producers, especially those with herbicide-resistant soybeans. Postemergence applications allow producers to apply the



correct herbicide and rate for specific weed infestations. This can save time and money. Producers should consider the logistics of postemergence

applications. While most postemergence herbicides provide very good weed control, they lack residual control. A preemergent residual followed by a postemergence treatment as needed may provide optimum flexibility.

Assure II/Matador, Select, Poast Plus, Fusilade and Fusion will provide excellent control of annual grasses but do not control broadleaf weeds. Basagran will do well on certain broadleaf weeds and is often tank mixed with Blazer or Scepter to broaden its spectrum. Pursuit and Raptor control a broad range of

weeds and both offer residual control, with Raptor having an edge over Pursuit with annual grasses. Reliance, Stellar, Pinnacle, and Synchrony provide good broadleaf control and can be tank mixed with a grass herbicide for maximum control of annual grasses. Many producers will be using Roundup this year, which will provide excellent weed control. Roundup provides good control at many weed growth stages; however, because Roundup lacks residual control, multiple applications may be needed.

Herbicides should be just a part of your weed control program for soybeans. An effective weed management plan will combine strategies in an integrated weed management program. Soybeans are very sensitive to early season weed pressure but are very competitive once they have developed a canopy. Narrow rows, timely cultivation and crop rotation also can help reduce weed competition. By using an integrated approach, weed competition can be effectively and economically eliminated.

**Jeff Rawlinson**

**Extension Assistant, Weed Science**

**Alex Martin**

**Extension Weed Specialist**

## Soybean chlorosis *(Continued from page 56)*

density should be at least 12 viable seeds per foot of row regardless of row spacing. This would not be recommended for drilled soybeans because of the extremely high rates of seed that would be required. Where soybean chlorosis is a problem, plant in 24-inch rows or wider.

The third way of correcting chlorosis is to apply material with the seed. In most instances only one material (iron chelate Fe-EDDHA) applied with the seed is effective. Fe-EDDHA is a dry powder that mixes easily with water. The most effective

rates usually have been 2 to 3 pounds of material per acre applied in 4-6 gal/A. This treatment is fairly expensive (\$10 to \$30 per acre) and should be applied only to those areas with the greatest chlorosis problems. The amount of chelate used is suggested on those soils where variety selection and seeding density are not able to overcome chlorosis. To develop application maps producers could take a color aerial photo of a field when chlorosis is more severe to

*(Continued on page 59)*



# Cultural practices favored for soybeans

## Planting rate

Response to soybean planting rates in Nebraska cropping systems is generally consistent with those from across the Midwest. Around 150,000 live seed per acre will provide maximum yields in both irrigated and rainfed Nebraska fields (*see table*). This is true in both wide and narrow rows. Crop canopies close sooner with higher planting rates, so in situations where fast canopy closure is important, higher planting rates may be important. Faster canopy closure is important in fields with high weed pressure and where post-emergence herbicides are used.

Our results differ from those of other Midwestern states in that we do not find that determinate varieties require higher rates than indeterminate varieties. If good seed-soil contact is possible at planting, we recommend planting about 150,000 seeds/A of both indeterminate and indeterminate varieties. This is about 8.5 seeds/foot in 30-inch rows.

## Row spacing

Narrow rows (drilled in rows 20 inches or less) are very popular in Midwestern states east of Nebraska where narrow rows show consistently better yield than wide rows. This does not happen in Nebraska. We have found that in low yielding situations (30 bu/acre), 30-inch rows slightly out-yielded 10-inch rows, and in higher yielding fields (50 bu/acre), 10-inch rows slightly out yielded 30-inch rows. Surprisingly, in all cases 20-inch rows were similar to or more productive than the other row spacings. The NebGuide, *Narrow-row Soybeans*, G90-963, provides more information on how to make economic comparisons among row spacings. It's available from Cooperative Extension offices or on the web at: <http://www.ianr.unl.edu/pubs/fieldcrops/g963.htm>

Seeding rate effects: averages of five varieties, three row spacings, two water levels, and five locations. University of Nebraska, South Central Research and Extension Center, Clay Center

| Seeding rate | Yield<br>(bu/a) | Plant height<br>(inches) | Canopy closure<br>(days from planting) | Lodging score<br>(1 erect, 5 down) |
|--------------|-----------------|--------------------------|--|------------------------------------|
| 45,000       | 35              | 24.5                     | 91                                     | 1.19                               |
| 140,000      | 40              | 26.8                     | 73                                     | 1.16                               |
| 235,000      | 40              | 27.3                     | 68                                     | 1.33                               |
| 330,000      | 40              | 27.3                     | 66                                     | 1.53                               |

## Planting Date

Soybean varieties respond much differently to delayed planting than corn or grain sorghum hybrids. This is because soybean flowering is more closely related to photoperiod (the length of the daily light and dark periods) than either corn or sorghum. The shift from the vegetative to the flowering stage in soybeans is caused mostly by changes in the length of darkness. Adapted varieties flower soon after the dark period begins to lengthen in late June.

Soybeans have a unique ability to yield well when planted over an extended time. This permits them to

complement other crops in Nebraska's cropping system. Soybeans planted in mid to late May are more productive than those planted earlier or later. Yields are considerably lower after mid-June. Plant heights are greatest from mid-May to mid-June and are shorter with earlier and later planting dates.

See the NebGuide, *Soybean Planting Date — When and Why*, for more information. It's available from Cooperative Extension offices or on the web at <http://www.ianr.unl.edu/pubs/fieldcrops/g687.htm>

**Roger W. Elmore**  
Extension Crops Specialist

## Plant and Pest Diagnostic Clinic

Soilborne wheat mosaic has been diagnosed on many wheat samples from throughout the state in the last two weeks. See the *Crop Watch* article (98-2) entitled "Soilborne wheat mosaic lab identified" for more information on identification. The other most prominent problem we have been seeing in the Clinic is winter injury to conifers. See the *Crop Watch* article entitled "Delay pruning and observe damaged pines" (98-2).

Also identified in the last week was tan spot on wheat and *Cercospora* blight on juniper.

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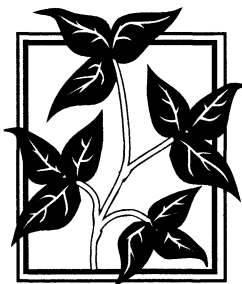
# Threat of sclerotinia stem rot growing; resistant cultivars offer long-term solution

While Nebraska's soybean acres and yield continue to rise, so does concern over the potential impact of sclerotinia stem rot — a major disease threatening the state's crop. Since 1992 sclerotinia stem rot has increased in incidence and severity in Nebraska's soybean fields, much as the disease has done earlier in Iowa, Michigan, Wisconsin and other soybean-producing states. It's estimated that last year alone, Nebraska soybean producers lost more than \$12 million to the disease. UNL researchers are looking for short-term fixes and more importantly, long-term solutions developed through improved disease resistance.

Sclerotinia stem rot, sometimes called white mold, is first visible during pod formation when a white, fluffy, moldy condition develops on the stems and pods. Leaves on infected plants usually wilt and turn gray-green before turning brown, curling and dying. The fungus develops sclerotia on or inside the stem and pods. Sclerotia are hard dark-colored structures 1/16-3/4 inch long, that can fall to the ground during harvest. Sclerotia can survive the winter in debris or soil, germinating in late spring or early summer by producing small mushroom-like tan, fleshy structures bearing millions of airborne spores which can infect soybean blossoms.

## Control options limited

Sclerotinia stem rot is especially difficult to control because the fungal pathogen can survive up to 10 years in the soil and a wide range of plants — nearly 400 species including oil seed crops, vegetables and broadleaf weeds — can host the pathogen. Cereal grains such as corn, wheat and other monocots are not hosts for the disease. Control measures are relatively limited. The potential for spreading the disease



means that infested areas should be rotated out of production to a susceptible crop for two to three years.

One fungicide,

Topsin-M, is registered for sclerotinia stem rot on soybeans, however it must be applied before the disease symptoms are visible, potentially leading to application when not necessary. Cultural practices such as wider row spacing and reduced irrigation that can reduce sclerotinia stem rot often compromise yield since stem rot severity is positively correlated with plant vigor.

## Research seeks long-term solutions

Disease resistance is the most cost effective control measure, however, research is needed to identify and/or develop resistant cultivars. A few genotypes with reduced susceptibility have been identified but none of them are

adapted for Nebraska. UNL researchers are now working to develop lines and cultivars with sclerotinia stem rot resistance for Nebraska. To meet this challenge, we have developed a laboratory technique to facilitate screening for resistance to this disease in soybean germplasm. A current research project at the University of Nebraska is laying the foundation for developing better disease resistance by:

- 1) identifying soybean lines with resistance to sclerotinia stem rot using the excised leaf assay and molecular genetic markers.
- 2) crossing identified resistant lines to high-yield soybean cultivars;
- 3) testing chemicals for inducing resistance to sclerotinia stem rot in existing soybean cultivars and comparing these to the registered fungicide; and
- 4) studying row spacing and cultivar effects on stem rot severity.

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## Soybean chlorosis *(Continued from page 57)*

use as a basis for turning iron treatments off and on. With the advent of precision farming and variable rate applicators, these maps could be used to automatically apply treatments as soybeans are planted.

The last method for correcting chlorosis is a foliar treatment. This usually is a last resort because it comes too late to effectively make a difference in plant growth and yield. Usually, more than one application is needed and treatments need to be applied as soon as the chlorosis begins to show. They should be repeated at 7 to 10 day intervals until the new growth is normal in color. Plants can be sprayed with a 1% solution of iron

sulfate (4 pounds of ferrous sulfate heptahydrate in 25 gallons of water makes a 1% solution). Higher concentrations may result in excessive burn. Iron chelates can be used, but they are much more expensive. Fields should not be sprayed on hot windy days because of leaf burn. Early mornings or late evenings are preferred. High temperatures and high humidity at the time of spraying cause the most leaf burn.

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# Control musk thistles before seeds fly

Musk thistle (*Carduus nutans* L.) is a noxious weed widespread throughout Nebraska. This plant spreads rapidly, forming dense stands that crowd out desirable forages. When musk thistle was introduced into the United States in the early 1900s, its natural predators from western Asia unfortunately did not come with it. In 1932, the first documented plant was identified in Nebraska and by 1959 musk thistle was declared a noxious weed here.

The key to good control of musk thistle, which is a biennial, is to control young plants in early-to-mid May while in the rosette stage and before elongation of flower stems or bolting. Control after bolting is possible, however seeds may still mature after treatment. Since each plant can produce up to 100 heads with up to 20,000 seeds, heads should be removed. Uncontrolled plants result in rapid infestation.

Although musk thistle is not poisonous, livestock will not graze near the plants and may refuse to enter heavily infested areas. Musk thistle is also highly competitive with desirable forage species, robbing massive amounts of soil moisture from forage species.

## Chemical control

There are many herbicides that offer good control of musk thistle. A

## Tractor museum open house May 2

Vintage and state-of-the-art tractors will be displayed May 2 during an open house on the University of Nebraska-Lincoln's East Campus. The open house begins at 2 p.m. in the original NU Tractor Test Laboratory northwest of 35th and Fair Streets. At 3 p.m., the building will be dedicated, followed by a 1950s-style Tractor Power and Safety Day and a Parade of Tractors.

## Response of musk thistle to herbicides

| Herbicide      | Rate per acre | Timing               | Percent control |
|----------------|---------------|----------------------|-----------------|
| Ally           | 0.3 oz        | Rosette, pre bolting | 83-87           |
| 2,4-D amine    | 2 qt          | Rosette, pre bolting | 92-96           |
| 2,4-D + Banvel | 1 qt + 0.5 pt | Rosette, pre bolting | 92-95           |
| Stinger        | 5.5 oz        | Rosette, pre bolting | 97-99           |
| Tordon         | 8 oz          | Rosette, pre bolting | 96-98           |
| Curtail        | 2 pt          | Rosette, pre bolting | 88-95           |

chemical treatment must suppress the plant and prevent it from producing seed. Apply herbicides before bolting to reduce the amount of viable seed produced for next year. Good control can be had with 2,4-D + Banvel at the rosette stage or before bolting, resulting in suppressed growth and dramatic reduction in seed production. Tordon at 8 ounces per acre has shown consistent control of musk thistle. Ally, Curtail and Stinger showed very good control of musk thistle.

## Grazing restrictions

Grazing restrictions apply to the treatments described above so use caution. Lactating dairy animals should not be introduced for one week after a 2,4-D or Banvel application and two weeks after Tordon. Hay harvest interval for Banvel is 37 days, 2,4-D is 30 days and Tordon is 14 days. Follow all precautions to prevent contamination of livestock and or hay.

## Mechanical control

Musk thistle can be suppressed by mowing or shredding, resulting in reduced seed production. In normal stands mowing at early bloom stage is best because plants will not resprout, although younger plants may require additional control measures. If mowing occurs mid to late bloom, mowing may increase infestations by scattering

seed. Cutting plants at the base and removing any heads can control individual plants.

## Cultural control

Good management in spring crops usually retards musk thistle. Fields with heavy infestations could be cropped for a few years so tillage and herbicides could reduce infestations. Good grazing management also may help retard infestations. Grasslands grazed too closely or with too much pressure are prime candidates for musk thistle infestation. Heavy livestock use opens forage stands to musk thistle, especially in moist areas.

## Biological control

In 1972, the musk thistle seed weevil, a natural musk thistle predator, was introduced into Nebraska from southern Europe. The weevil larvae feed at the base of the flower and interfere with seed production. This approach can take six to eight years before an appreciable reduction is noticed. A minimum of 500 adults should be released in one area for control. For obvious reasons, this method is not compatible with mowing or spraying after plants bolt. However herbicides applied prior to musk thistle bolting are compatible with the weevil.

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